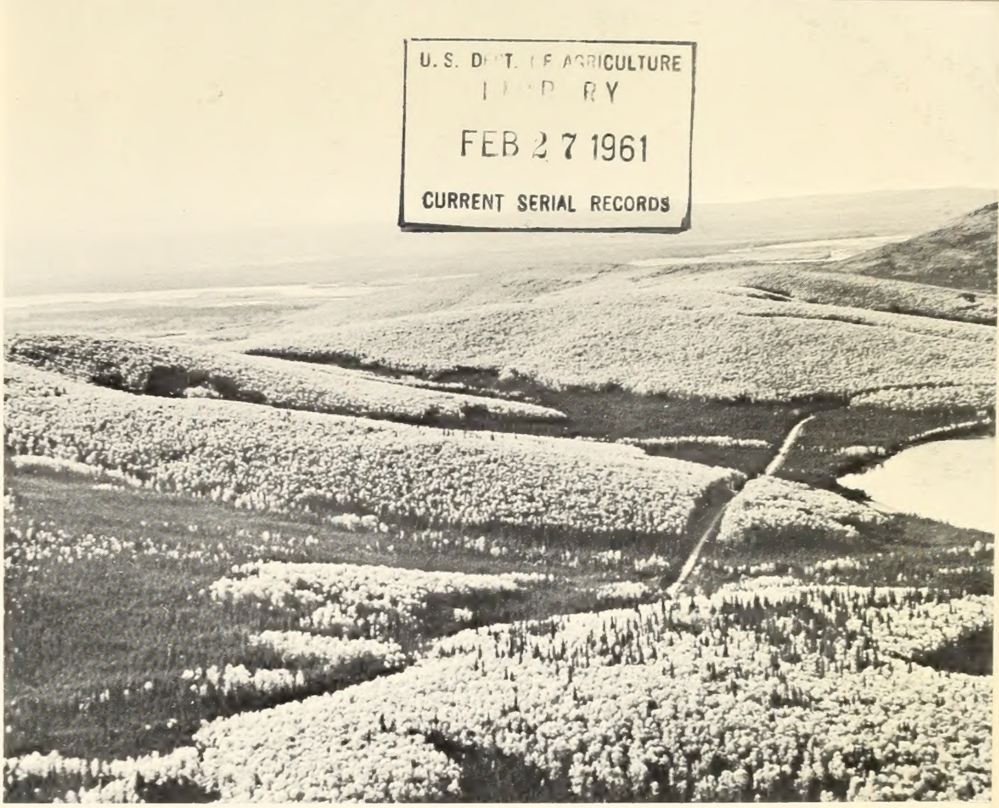
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

9.9
76.2
op. 2

U. S. DEPT. OF AGRICULTURE
LIBRARY
FEB 27 1961
CURRENT SERIAL RECORDS



BIENNIAL REPORT

ALASKA FOREST
RESEARCH CENTER
JUNEAU --- ALASKA

1958
1959

FOREST SERVICE --- U. S. DEPARTMENT OF AGRICULTURE

BIENNIAL REPORT--1958 - 1959

ALASKA FOREST RESEARCH CENTER

U.S. Department of Agriculture, Forest Service
Juneau, Alaska

A. E. Helmers, Acting Forester in Charge

STATION PAPER NO. 13
JUNE 1960

COVER PHOTOGRAPH

Paper birch stands with occasional associated white spruce, intermingled with black spruce muskegs and patches of pure white spruce. Birch Lake in right center, Tanana River in background, about 50 miles southeast of Fairbanks, Alaska.

Alaska was much in the news in the late Fifties. The opportunities and bright future of the State were referred to often. A substantial segment of this future is in Alaska's forests. While intensive forestry may be some distance in the future, pulp industry development and accompanying forest management activities in Southeast Alaska, were big steps in that direction. Since intensive forestry cannot be isolated from fundamental forest research it is clear that the research job ahead is large and complex. Looking ahead to a time in future, the scientific forest management practiced then will be based on research accomplished by then--research in progress now and research that should begin in the Sixties.

Our goal for the Sixties is to develop a forest research program in line with the needs of the region. This means intensification of some aspects of the present program and starting new work in several fields that at present are large gaps in forestry information.

One outstanding need for research is the field of forest products utilization. Little western redcedar and Alaska-cedar is utilized in Alaska because an established market is lacking. There is a substantial volume of these species. Current production is often wasted, however, because it is necessary to cut cedar along with spruce and hemlock in clear cutting old-growth stands. A local industry probably would follow the development of economical methods for manufacturing cedar, and the development of new uses and markets.

Other little-used species occurring in large volumes are birch and cottonwood in the Interior. Research on the quality, capabilities, logging and manufacturing methods, and marketing should trigger the establishment of local industries based on these species.

As a general rule locally manufactured lumber fails to capture an appropriate share of the demand for lumber. Frequently it is a low grade product discriminated against locally and for export. The potential of Alaskan lumber for meeting local demands can be strengthened by research and technical assistance in many phases of manufacturing, seasoning, and marketing.

Other products, such as plywood, treated poles, piling, ties, mine timbers, and related materials await the production and marketing studies needed for the establishment of local businesses based upon local raw materials. These products are now imported from the other states.

How to obtain adequate fire protection is a big problem in the Interior where the area burned annually averages close to one million acres. A drastic reduction in losses due to fire is essential to reaching anything approaching the full timber-producing potential of the Interior. There are fire problems in Southeast Alaska also. The rapidly developing pulp industry is creating new fuel conditions. As clear cutting of old-growth stands progresses, large areas of slash and soil surface are exposed to drying conditions. Planning for adequate fire protection will require research on the amounts and types of fuel, how they respond to drying factors, and how fire behaves in these fuels.

The most recent epidemic of black-headed budworm and hemlock sawfly swept through all of coastal Alaska before subsiding in 1955. The net loss of hemlock was 268 million board feet. Outbreaks of other insects, such as the Sitka spruce beetle, spruce engraver beetle, Alaska spruce beetle, and spear-marked black moth have occurred over areas ranging from several thousand to many millions of acres. The amount of damage is unknown in many cases, particularly in the Interior forests. It is evident, however, that losses must be minimized before the forest manager will have a stable basis for planning timber resource utilization. Information on biology, ecology, and control of forest insects in Alaska is lacking in some cases and inadequate in others.

Young even-aged stands in Southeast Alaska have about twice the volume of wood per acre as old-growth stands. Even-aged stands are the desired forest but at present they make up only 10 percent of the commercial forest area. Conversion to even-aged stands is the foremost silvicultural task now. If a scientific basis for managing the new forest is to be available when utilization of even-aged stands begins, the research background will have to begin in the Sixties.

These are some of the high spots in forest research needs in Alaska but it is by no means a complete list. Forest research in Alaska is just beginning, so it follows that much research remains to be accomplished.

The pages that follow summarize progress on some of the research projects active during the past two years. Publications issued during 1958 and 1959 are included in the lists on pages 21 - 30. Copies of publications and additional information on research projects may be obtained from the Alaska Forest Research Center, Box 740, Juneau, Alaska.

THE FOREST SURVEY

When the Forest Survey of Alaska began in 1954, it was believed that general statistics useful in regional and national planning were all that was needed. However, a growing demand for timber along the coastal region of Alaska soon showed the need for local data to be used in preparing timber sales and forest management plans. Region 10 of the U. S. Forest Service, and the Alaska Forest Research Center, in charge of the Forest Survey activity, joined forces to meet national, regional, and local needs in one survey of the coastal forest areas. The survey of the Interior forests, however, is an extensive type survey to meet minimum needs and standards.

Southeast Alaska--The survey of Southeast Alaska forests was based on the study of aerial photographs, followed by field measurements to check the accuracy of the photo interpretation and to obtain supplemental tree measurements. A sampling technique was used, designed to determine the commercial forest area within ± 3 percent per million acres of forest land and the timber volume within ± 5 percent of the total net board-foot volume in each forest management unit.

The photography was 1:40,000 vertical photos and twin oblique photographs at a scale of 1:20,000, flown in 1948 by the U. S. Navy. Randomly selected plots of ten acres each were interpreted on the photos and a portion of these were sent to the field for examination. In the field three one-fifth-acre plots were measured at each location.

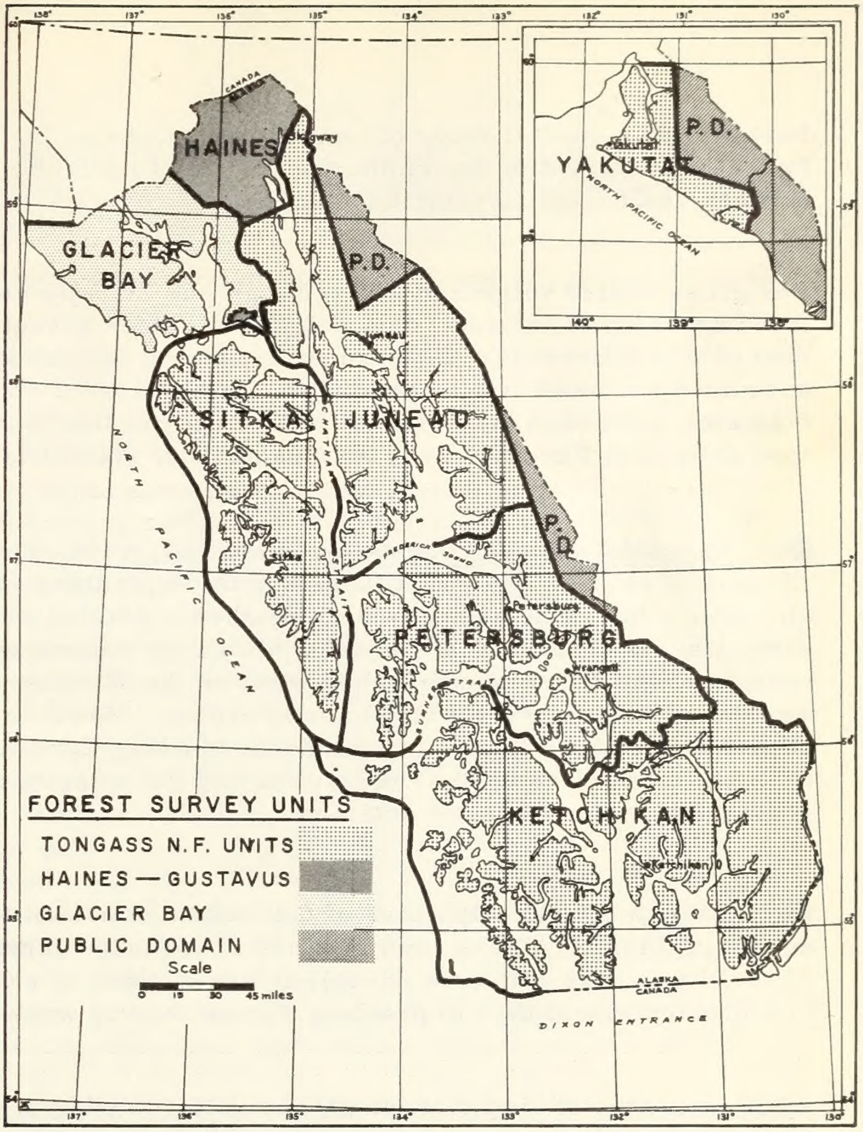
Table 1 gives a few highlights of the work that has been accomplished to January 1, 1960 on the Tongass National Forest and adjoining public and private areas (fig. 1A). The photo plots were randomly distributed over the gross land area, but the ground and air check plots were confined to the forested area which is 50 percent of the total area.

Table 1.--Total land and forest areas and number of plots studied, by Forest Survey units for southeastern Alaska, July 1954 to January 1, 1960.

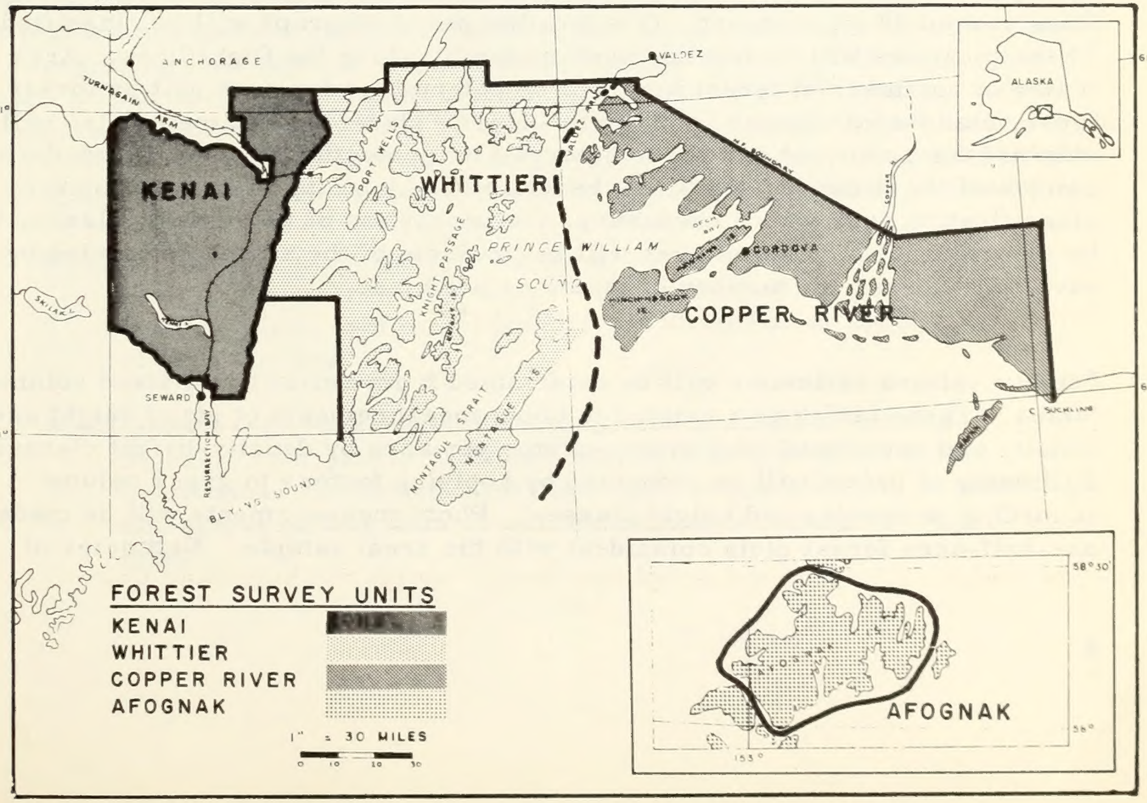
Survey unit	Gross land area	Total forest land	Photo plots studied	Ground plots inventoried	Air checked plots
	M acres	M acres	No.	No.	No.
Juneau	3,832.5	1,652.5	5,830	164	485
Sitka	2,433.3	1,740.2	3,314	129	328
Petersburg	3,286.6	2,356.6	4,347	129	663
Ketchikan	5,531.5	3,892.9	8,902	227	594
Yakutat	795.9	315.2	872	57	109
Glacier Bay	2,037.0	361.1	3,424	--	--
Haines-Gustavus	928.4	226.2	1,486	16	--
Public Domain	1,992.3	52.3	3,316	--	2
Total	20,837.5	10,597.0	31,491	722	2,181

Data compilation has been completed for all except the Ketchikan Unit.

Figure 1.--Forest Survey Units: A. Southeast; B. Chugach National Forest, Alaska



A.



B.

During 1959 a special study of logging operations on the Tongass National Forest was started to determine the degree of utilization and relationships between scaled and inventoried volumes.

The net utilized volume of logs, scaled by Puget Sound Log Scaling and Grading Bureau rules, was 26.4 percent less than the net inventory volume by Forest Survey standards. But, logging residues accounted for only 9.4 percent of this difference. Differences in scaling standards and practices accounted for most of the remainder. Loggers were not utilizing to the top diameter limit used in the forest inventory, but they were cutting a lower stump than defined in Forest Survey merchantability standards.

● Chugach National Forest--By January 1, 1960, Forest Survey work in the Chugach area (fig. 1B) was still primarily in planning stages. A preliminary plan (much the same as followed in Southeast Alaska) was prepared and sample form-class measurements were completed for volume table use. About 60 percent of the photo interpretation work on the Whittier and Copper River blocks was completed on new 1:15,840 aerial photos. However, new photography is needed for Afognak Island and the Kenai Working Circle. This was planned for 1959 but because of weather conditions and the priority of other aerial photography the photos were not obtained.

● Interior Alaska--Because of the extensive nature of the survey to be conducted in Interior Alaska, and because of the large acreage to be covered (some 229 million acres with tree cover), it was decided to rely upon aerial photographs to a greater extent than in previous Forest Survey work.

Area estimates of land classes will be determined by a dot-count on aerial photos. The photography is near completion at a scale of 1:5,000 along flight lines spaced 30 miles apart. One location per photograph will be classified. These locations will be marked systematically along the flight lines. Area estimates of commercial forest land will be determined for each unit by forest types, stand-size classes, and crown-density classes. Estimates also will be obtained for nonforest and noncommercial or protection forests. A statistical sample of the photo locations will be examined by air to check the accuracy of classification and, where necessary, the proportion of the various classes will be adjusted. Estimates of area will be products of the area represented by each location and the number of locations per class.

Timber volume estimates will be determined from aerial photo stand volume tables. These tables are related to photo measurements of stand height and density and correlated with gross volume per acre by density-height classes. Estimates of defect will be computed by applying factors to gross volume according to species and height classes. Photo measurements will be made on one-half-acre forest plots coincident with the areal sample. Estimates of total volume will be products of area and mean-volume-per-acre by classes. A sample of the photo volume plots will be field examined to provide a check on photo volume measurements.

Growth, species, diameter distribution and mortality data will be obtained from examination of field plots located at random within the various sampling strata of commercial forest land. These locations will be one-half-acre rectangular plots selected from the volume sample plots. Present plans call for measuring about 100 field plots.

Contracts to photograph the forest area of the Interior using infrared film were negotiated and most of the flying completed in 1959. Figure 2 shows the survey units of the Interior, areas for which aerial photographs are on hand, and the approximate direction of flight lines.

Interpretation of photo plots was begun in the fall of 1959. By January 1, 1960 about 50 percent of the photo interpreting job for unit seven was completed.

The three stereograms in figure 3 show the quality of the photographs being used and indicate some of the detail that can be seen on photos of this scale. In stereogram A, note the caribou herd grazing in the dark colored, tundra area. The lighter toned area is better drained and covered with grass and low brush. Stereogram B shows commercial forest area with some cottonwood and aspen along the stream and a mixture of aspen and spruce adjoining. The dominant trees are 80 to 90 feet tall. An old burned area, now restocking to aspen shows up sharply in stereogram C. Many stems from the previous stand are visible on the ground. In the center area is a spruce-aspen stand and a dense stand of aspen saplings and poles. In the upper right-hand corner is a stand of spruce.

● Indicators of Forest Land Classes in Interior Alaska--Topographic situations and forest vegetation conditions were studied over a wide range of land and vegetation classes. The objectives of the study were to (1) develop a basis for recognizing land capable of producing industrial wood and land not capable of such production; (2) determine guides or criteria, applicable to air photos, for separating burned areas into broad forest land classes. Details of the study are described in Station Paper No. 10 "Indicators of forest land classes in air-photo interpretation of the Alaska Interior". Examples of the criteria are:

White spruce--a fairly good indicator of commercial forest land; usually absent from muskeg forests, intolerant of poorly drained, cold, wet soils; permafrost absent or at depths of 24-36 inches.

Black spruce--a characteristic muskeg tree in Alaska, usually on cold, wet, poorly drained sites; permafrost 12-20 inches below moss and lichen layer; this type on north-facing slopes and slopes of less than 10 percent indicates noncommercial sites.

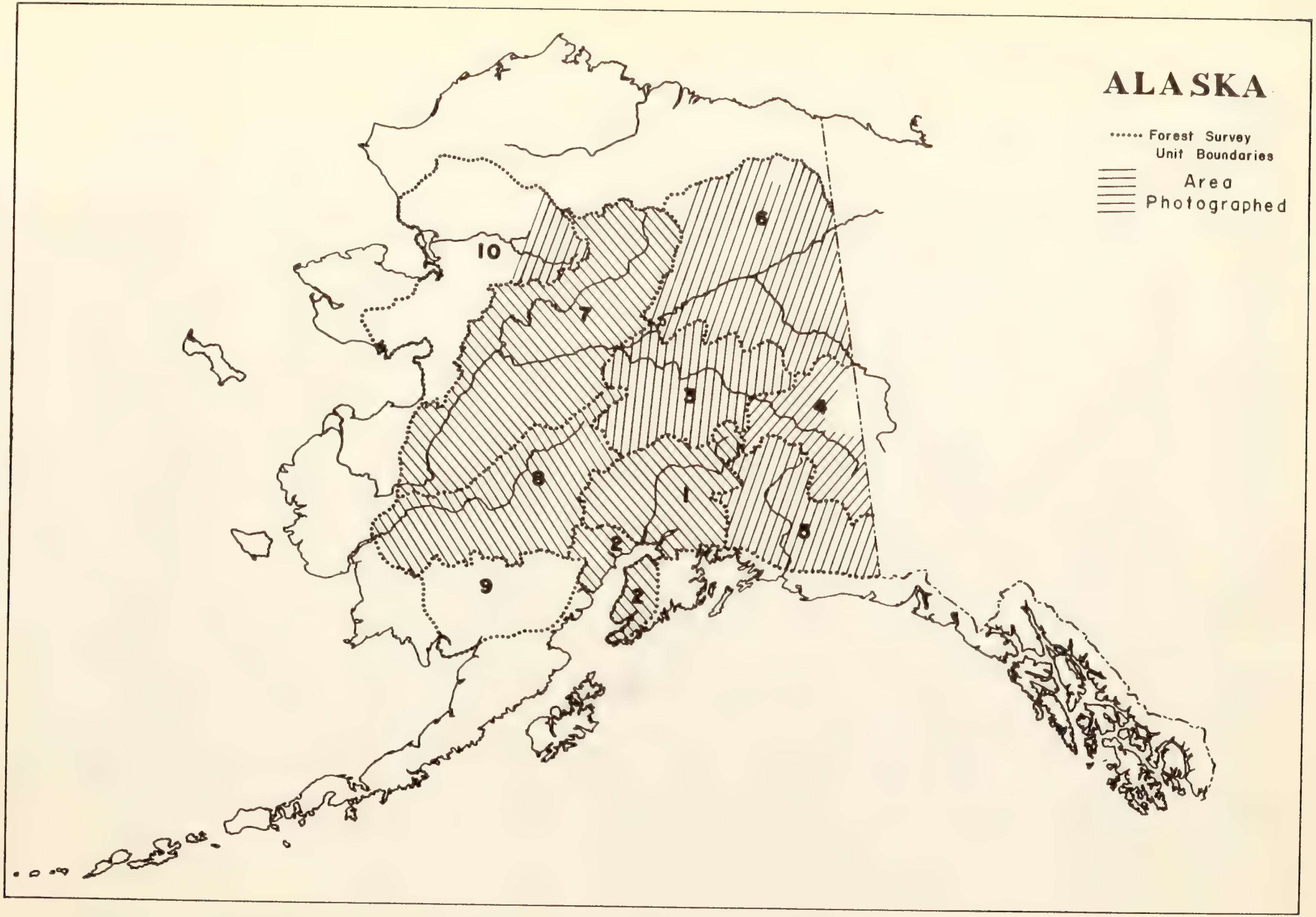
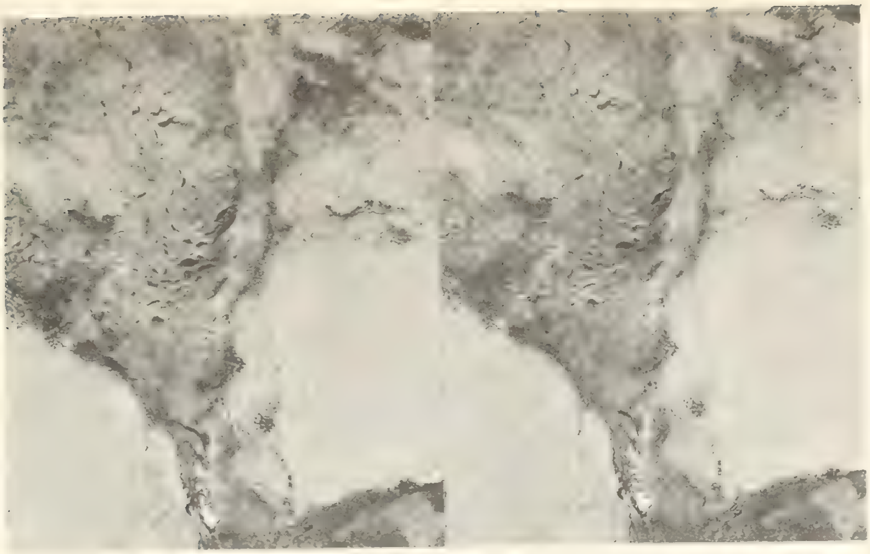
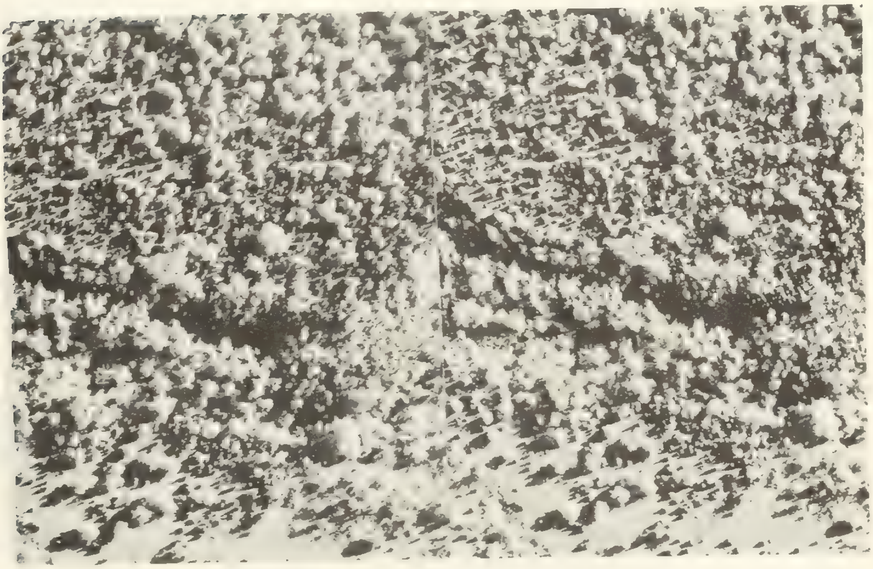


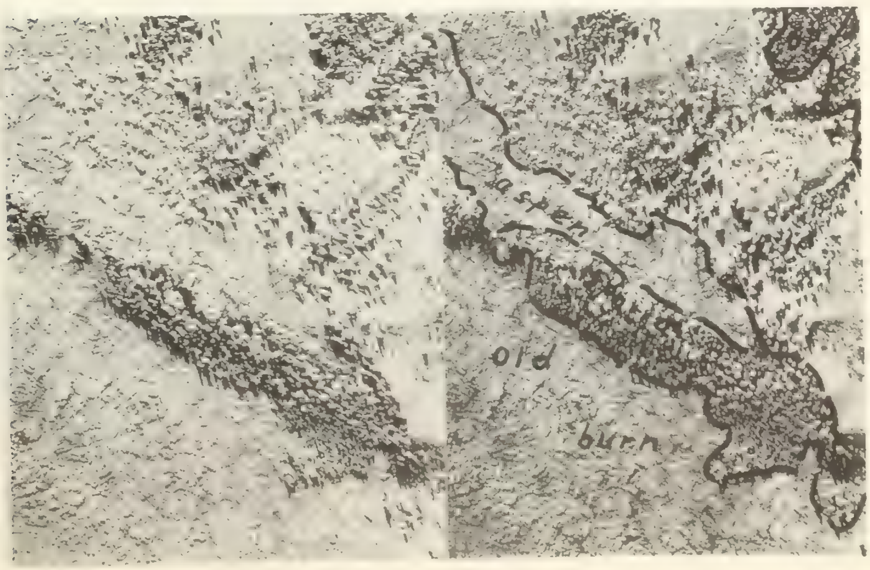
Figure 2.--Forest Survey Units in Interior Alaska showing status of aerial photography and approximate direction of flight lines.



A



B



C

Paper birch--commercial forest land; fair to good drainage; permafrost absent or at depths of 36-48 inches.

Aspen--indicates that permafrost is absent or at depths of 48 inches or more below surface; good indicator of commercial forest land except on over-steepened south-facing slopes of 60 percent or more gradient.

The nature of boundaries of vegetation types, slope exposure, gradient, and other tree and shrub species are additional indicators explained in the Station Paper.

FOREST INSECT RESEARCH

● Systematic Accumulation of Insect Collection Data--A program for coding and placing on punch cards much of the basic data obtained from collections of forest insects in Alaska was designed, patterned after the Canadian Forest Insect Survey.

This system will provide a large amount of information about the many forest insects of Alaska, including such items as distribution, tree host preferences, preferred stand and tree conditions, certain environmental preferences, insect associations, yearly trends in population levels and parasite relationships.

Most of the codes and forms for this system have been developed and some field testing of the method has been done. A considerable amount of work remains in developing satisfactory rearing techniques, and developing guides for the identification of immature insects as they are received in the laboratory.

The system is designed for all types of insect collections, from incidental collections to formal quantitative samplings. A standard collection record form has been developed which is completed for each collection. The information on this form is coded for the final card punching.

Overleaf: Figure 3.--Stereograms, 1:5,000 scale. A. Dark area is tundra, lighter tone is grass and low brush. B. Commercial forest with cottonwood and aspen along the stream and a mixture of aspen and white spruce adjoining. C. Old burn, now restocking; center area is a spruce-aspen stand and a dense stand of aspen saplings and poles; white spruce stand in upper right corner.

There are usually several steps between the collection in the field and the completed collection record. Many collections are of immature insect stages that require rearing in the laboratory. Rearing provides answers on the amount of parasitism by parasite species and rearing is often necessary in identifying the host insect.

Placing all of this information on punch cards will allow the data to be easily extracted at any time.

● *White Spruce Cone and Seed Study*--A study of white spruce cone and seed damage caused by insects was started in 1958. This is part of a long-term cooperative study with Forest Management Research on the natural regeneration of white spruce in Interior Alaska.

Cones were collected in late August of both 1958 and 1959 along several highways leading out of Fairbanks. Collections were made after cone maturity but before seed fall. In 1958 180 cones were collected and in 1959 240 cones. The 1958 cone crop rating averaged 9, defined as "many cones on 75 percent of the trees, some cones on all trees". In 1959 the cone crop rating averaged 4--"few cones on 25 percent of the trees, many cones on occasional trees".

In 1958 insect damage was light with only 1.9 percent of the seed destroyed by *Megastigmus* sp. and 4.2 percent of the cones infested by *Laspeyresia youngana* Kearfott. Other insects, although present were not significant.

In 1959 insect caused damage increased, 2.8 percent of the seed were destroyed by *Megastigmus* sp. and 14.2 percent of the cones were infested by *Laspeyresia youngana*. Gall midges were found in 70.2 percent of the cones and an as yet unidentified insect or insects caused extensive damage to 71.4 percent of the cones. Many of the cones supported populations of several different insects.

Collecting all of the samples in one brief period has made it difficult to appraise certain types of insect-caused damage. Additional samples obtained midway in the period of cone development would help in evaluating damage.

● *Spear-marked Black Moth Study*--In 1957 a large outbreak of the spear-marked black moth (*Eulype hastata* (L.)) (fig. 4) developed in paper birch (*Betula papyrifera* Marsh.) stands in the vicinity of Fairbanks. This outbreak posed a threat to many birch stands in the area, including some of sufficient esthic value to warrant consideration of control measures. A nearly complete lack of information on the insect led to a study of its biology and control in 1958. It was originally planned to continue this study through at least two seasons but with a drastic reduction in the population in the late summer of 1958, the study was discontinued.

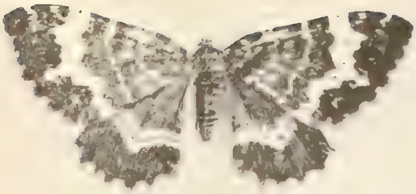


Figure 4. --
Adult spear-marked black moth, about 1-1/2X.

The life history of the spear-marked black moth, as determined by the 1958 study, is given in Figure 5.

To estimate the effectiveness of an aerial spray application for controlling this insect, a spray test was made on the ground using an aerial spray formulation of DDT. The spray consisted of one pound of technical DDT, one-quarter gallon of Velsicol AR-50, and #2 fuel oil to make one gallon. The spray was applied with a compressed air sprayer at the rate of approximately one gallon of spray per acre. The spray was 98.3% effective in controlling third instar larvae.

A water emulsion of DDT was tested for its effectiveness as a ground spray for use on ornamentals and along roadsides. The test emulsion consisted of one quart of 25% DDT in three quarts of water. The spray was applied with a compressed air sprayer to the runoff point against third instar larvae. Complete control was obtained.

● Noteworthy Insect Outbreaks--During the past two years the Alaska spruce beetle built up to epidemic populations in the white spruce stands of the Kenai Peninsula. Heavy tree loss is occurring in the northeastern part of the Kenai National Moose Range and within several drainages of the adjacent Chugach National Forest. Several thousand trees within the National Moose Range are believed to be currently infested. On the more accessible National Forest areas an estimated 1,000 trees are currently infested. Losses on the Moose Range are not considered undesirable because spruce is a hinderance in the management of moose. Control on other lands is being considered.

The spear-marked black moth outbreak, that started in 1957, increased in severity in paper birch during the early summer of 1958 but declined sharply in mid-summer and remained low in 1959. In 1958 the infestation extended over a gross area of 5,829,000 acres in the vicinity of Fairbanks, with heavy defoliation occurring on 333,000 acres. The sharp population drop was caused by a granulosis virus and by insect parasitism. Control was not attempted.

The black-headed budworm and hemlock sawfly are again showing signs of a general buildup in the hemlock-spruce stands of Southeast Alaska.

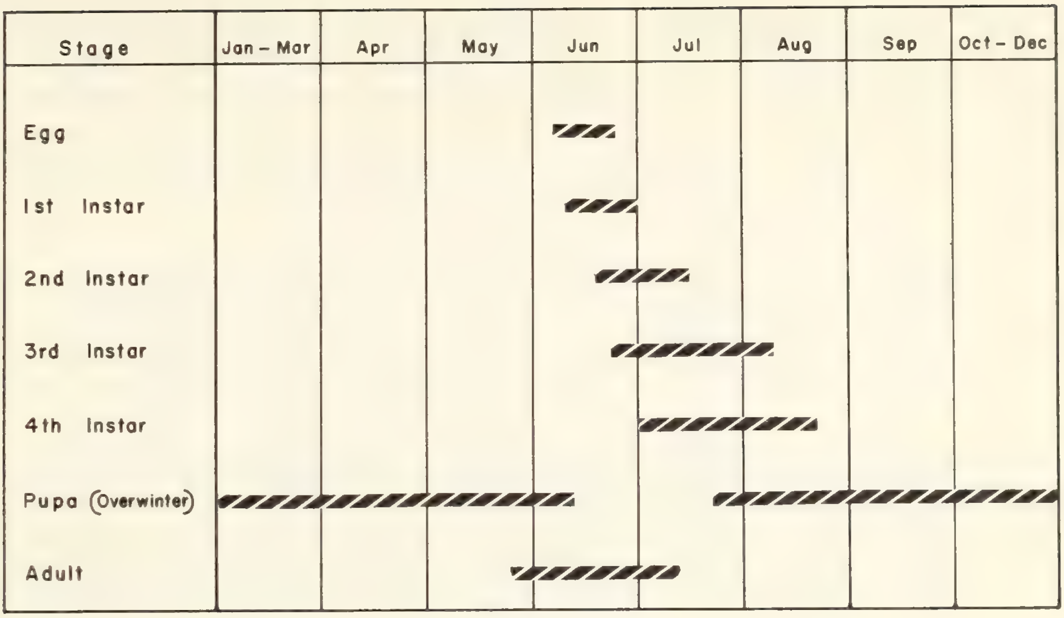


Figure 5.--Life History of the spear-marked black moth, Mile 302, Richardson Highway, Alaska - 1958.

A small population increase was detected around Ketchikan in 1958. In 1959 high populations of these two insects were found in Cholmondeley sound, Kasaan Bay and Portland Canal. It is probable that this condition exists over most of this general area.

FOREST MANAGEMENT RESEARCH

● Seed Dissemination and Natural Stocking--Station Paper No. 12, "Natural stocking of a mile-square clear cutting in Southeast Alaska", is a progress report on studies to determine seed dispersal distance and the development of natural reproduction in a large clear cutting. Adequate natural stocking of clear cuttings in Alaska is partly determined by size and shape of the cutting. Amount and dispersal distance of seedfall are important factors determining the effectiveness of size and shape.

A study on an experimental 700-acre clear cutting near Hollis, Prince of Wales Island, shows that the amount of seed dispersed into the cutting decreases rapidly from the edge of the uncut timber (fig. 6).

Many seedlings that were established beneath the old-growth stands survived felling and yarding despite the severe ground disturbance caused by high-lead and tractor logging (fig. 7). This "advanced" reproduction is an important component of total stocking. The 700-acre experimental clear cutting is satisfacotrily stocked.

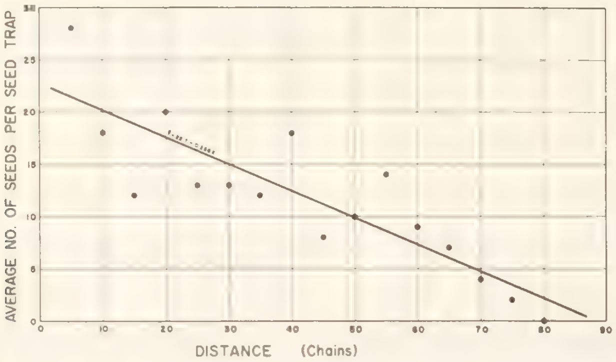


Figure 6.--Relationship of seed trap catch to distance from seed source in a "medium" cone crop year.

Average mil-acre stocking by advanced reproduction was 30 percent; by seedlings originating after logging, 50 percent; and 58 percent by advanced and subsequent seedlings combined.

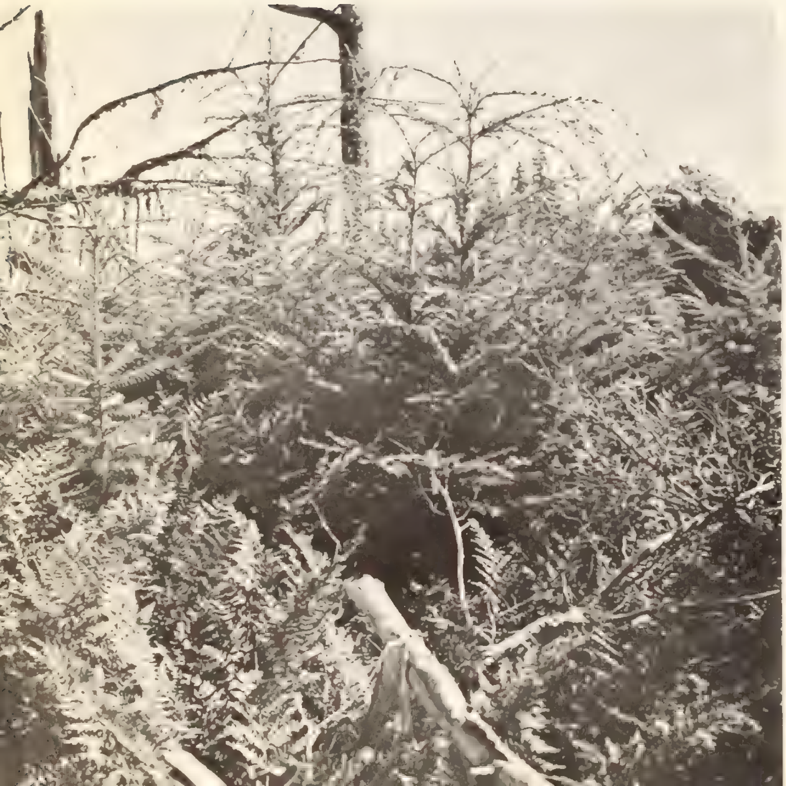


Figure 7.--A group of "advanced" western hemlock and Sitka spruce reproduction that survived logging disturbance.

Some mortality is occurring and if this is coupled with several years of nil or light seed crops the result could be less than full stocking. The threat of a catastrophic reduction in seedling numbers by such agencies as fire, small mammals, or insects, makes it desirable that clear cuttings are of a size that can regenerate naturally from local seed sources until full stocking is assured. Present recommendations are that no part of a clear cutting should be more than 20 chains from an effective seed source.

● Seed Production in an Unmerchantable Stand.--A study of seed production in a stand with timber volumes below present limits of merchantability was summarized in the biennial report for 1957-58. Since then, the details were published as Technical Note No. 43, "Seed production in a scrub stand."

This exploratory study indicates that large quantities of seed are produced by scrub trees, particularly western redcedar. The production of about 46 pounds of seed per acre of all species during a light to medium seed year compares favorably with the production of 91 pounds obtained in another study in a climax stand during a "bumper" year.

Scrub stands will be increasingly important seed sources as pulp logging increases. Such stands often border commercial stands. Thus they are seeding in parts of many cutover areas. The genetic desirability of scrub stands as seed sources is a problem in need of study.

● Regional Cone Crop Ratings.--A system developed by the Oregon State Board of Forestry for rating cone crops was adopted in the Alaska region. The system is used in a long term study designed to establish seed crop periodicity and the relationships between size of seed crop and such factors as weather.

Technical Note No. 50 "1959 cone crop report for Alaska tree species", describes the rating system and summarizes the reports for the 1959 season. Many years of records will be needed before conclusions can be developed. Cone crop ratings for the first three seasons are summarized in table 2.

● Other seed studies are in progress to determine seed production in white spruce and paper birch stands and to determine the character and amount of seed crop losses to squirrels and to insects.

● Estimating Site Index in Sapling and Pole Stands.--The usefulness of conventional height-over-age curves for estimating site index in Southeast Alaska is limited to stands older than 30 or 40 years. For younger stands a method

Table 2.--Average cone crop ratings for Southeast Alaska. 1956, 1957, and 1958.

Species	Rating			
	1956	1957	1958	1959
Sitka Spruce	7	2	6	7
Western hemlock	4	6	3	6
Western redcedar	8	1	1/	7

1/ Insufficient data for rating.

reported in Canada for young stands of Douglas-fir was tried in western hemlock-Sitka spruce stands. The results were published in Technical Note No. 48, "Estimating site index in sapling and pole stands in Southeast Alaska".

Briefly, the method consists of measuring the distance between the first six nodes above breast height on six dominant and codominant spruce on each plot. The 6-node span is used to determine site index from figure 8 or by the formula:

$$\text{Site Index} = 6.5\ (\text{6-node span in feet}) + 55.1$$

Some cautions in using the method and the limits of accuracy that may be expected are explained in Technical Note No. 48.

● A big problem in the Interior will be regeneration of white spruce, paper birch, and aspen. These species are widespread and considerable information is available from Canadian, U.S., and foreign sources. A thorough study of the literature is in progress to determine what information might be applicable to Interior Alaska. The review will also identify some of the larger gaps in information needed under Interior conditions.

● Identification of Spruce Seedlings in Interior Alaska.--While mature white spruce and black spruce are readily identified, they are difficult to differentiate in the juvenile stages. A study of seedlings grown from seed in the laboratory and of natural seedlings under field conditions was made to investigate diagnostic characteristics reported in Canada and elsewhere.

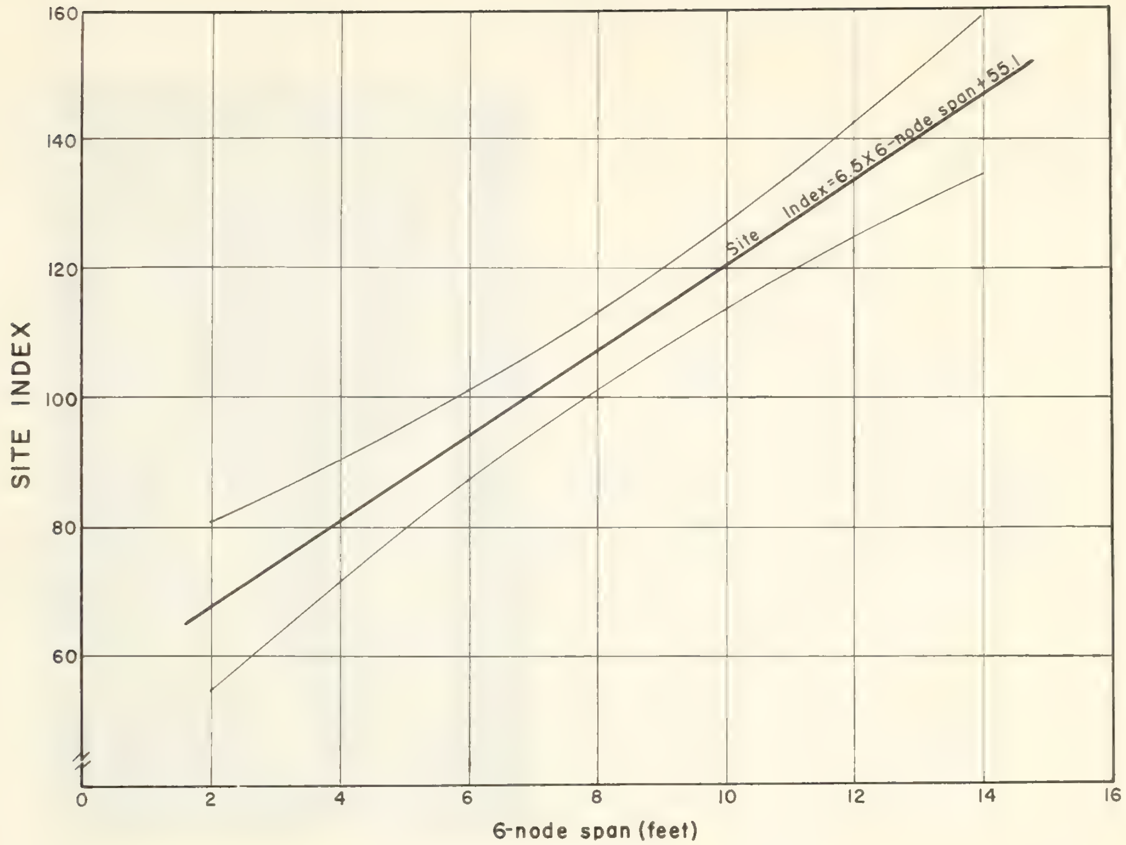


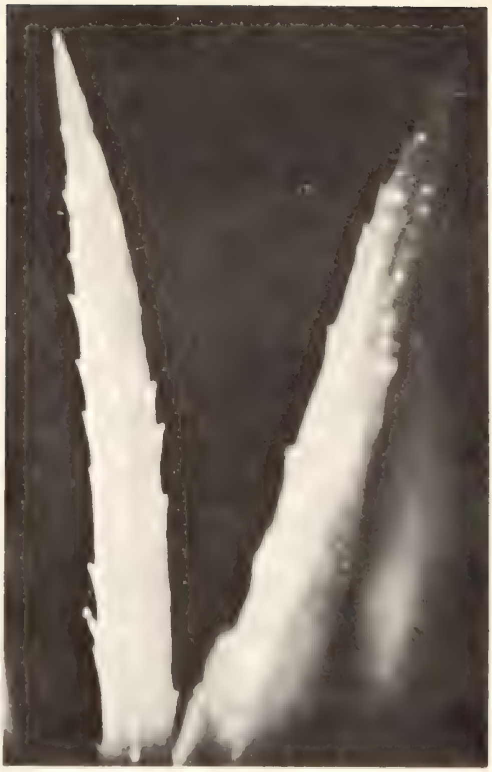
Figure 8.--Graph for estimating site index from measurements of 6-node span, with confidence limits for the 95 percent level of probability.

Without exception the cotyledons and primary leaves of 1-year seedling white spruce were serrulate on the margins (fig. 9) while similar leaves of black spruce were entire. In addition, white spruce averaged more cotyledons per seedling than black spruce. Serrulations proved to be a reliable characteristic on seedlings up to about nine or ten years of age. The gap in identification characteristics is between this age and the age when distinguishing features characteristic of mature trees are developed.

Additional details as well as a summary of the experience of other investigators is given in Technical Note No. 45, "Identification of spruce seedlings in Interior Alaska".

● Forest Soil Organic Layer Development.--Samples of unincorporated forest soil organic layers from three stands of different ages indicated the relationship of weight to time shown in fig. 10. At the end of 125 years, 20 percent of the mature weight was accumulated. An additional 50 percent was

Figure 9.--Serrulate margins on 1-month-old juvenile leaves of white spruce.



accumulated in the next 105 years. More information on this study is published in Technical Note No. 47, "The development of forest soil organic layers in relation to time in Southeast Alaska".

● Seasonal Growth Data--Birch, Spruce, and Aspen.--Paper birch leader growth near Fairbanks in 1958 started the last week in May and ended the beginning of the second week in July. The season's growth occurred in less than 50 days, 90 percent of it in one month. Radial growth of birch, white spruce, and aspen started about the beginning of June and ended the middle of July.

This information was obtained as part of a study of the biology of the spear-marked black moth and is presented in greater detail in Technical Note No. 46 "Some seasonal growth data for paper birch, white spruce, and aspen near Fairbanks, Alaska--1958".

● Birch Growth and Volume.--Field and office work for a study to determine the capacity of Interior forest lands for growing paper birch is nearly completed. A report will be published shortly. Height-diameter volume tables for paper birch are completed.

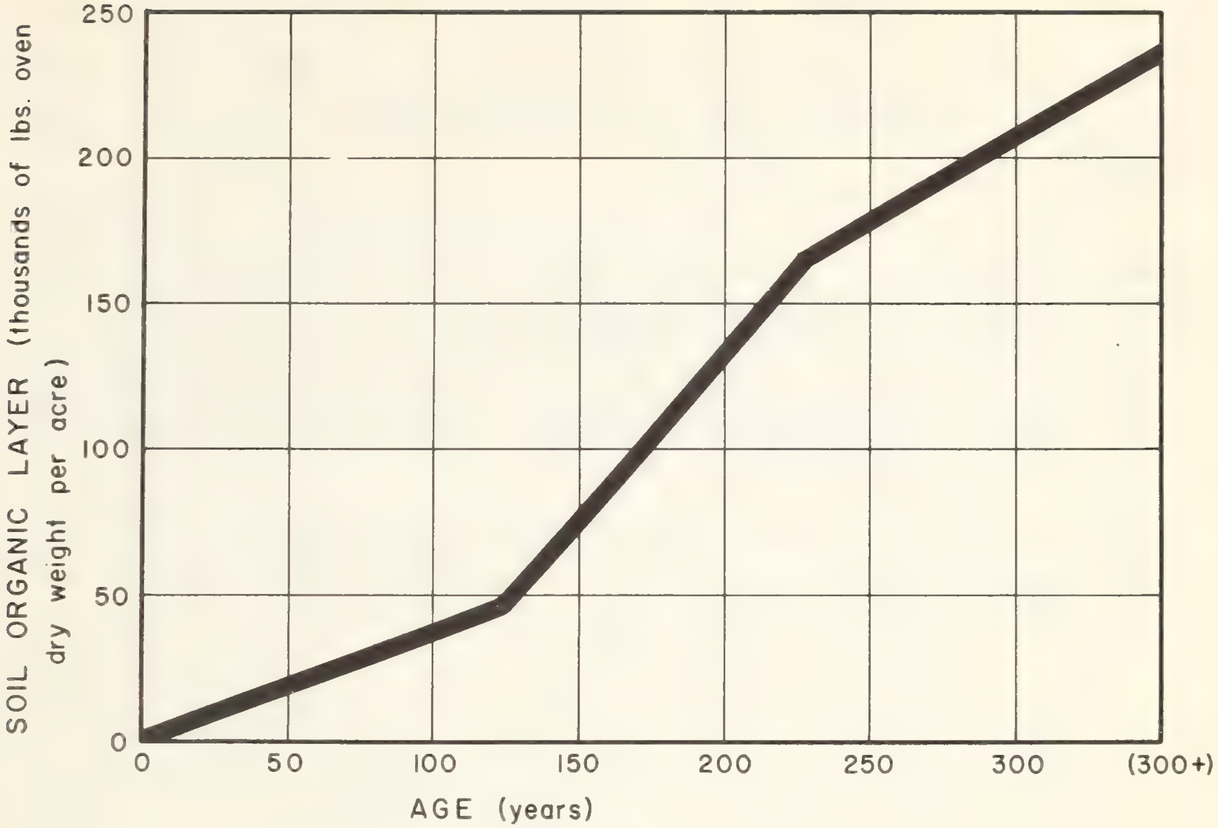


Figure 10.--Development of forest soil organic layer in relation to stand age.

WATERSHED MANAGEMENT RESEARCH

● Salmon Stream Studies.--The first comprehensive report on salmon streams and logging was published in 1956[1]. It described the objectives of the study of the effect of logging on salmon spawning streams in Southeast Alaska and summarized study stream information such as climate, streamflow, water temperature, sedimentation, and stream channel change for a period prior to logging. A second report that is nearly completed discusses what has happened in Maybeso Creek, the first of the study streams in which logging has been completed.

Briefly, the analysis shows that logging in Maybeso Creek has not resulted to date in a change in streamflow pattern, or in minimum winter streamflow, summer base flows, and water temperature.

Suspended sediment concentrations remain low at low to medium stream velocities. The concentration increases considerably at high discharge rates in the logged stream but were found to be no greater than in the unlogged control stream.

Sediment is a particularly important factor in salmon spawning streams. It affects subsurface water flows in streambed gravels and consequently it affects the supply of oxygen necessary for salmon egg and fry survival[1/]. The importance of this factor and the high variability found between samples and streams has led to a plan for intensfying sediment studies both in the streams and on the land. This phase of the study is being investigated jointly by the Research Center and the Fisheries Research Institute.

[1/] Royce, William F. On the possibilities of improving salmon spawning areas. Trans. Twenty-Fourth N. American Wildlife Conf., pp. 356-366, 1959.

LIST OF PUBLICATIONS, 1949-JUNE 1960

U. S. Dept. Agriculture Publications

Downing, George L.
1959. Hemlock sawfly. USDA, Forest Service, Forest Pest Leaflet 31, 4pp.

Lutz, H. J.
1956. Ecological effects of forest fires in the Interior of Alaska. USDA Tech. Bul. No 1133, 121pp.

Taylor, Raymond F. and Elbert L. Little.
1950. Pocket guide to Alaska trees. USDA, Forest Service, Agricultural Handbook No. 5, 63pp.

Station Papers

No.

1. Lutz, H. J.
1953. The effects of forest fires on the vegetation of Interior Alaska. 36pp.

2. Alaska Forest Research Center.
1955. Annual report, 1954, 35pp.

3. Andersen, H. E.
1955. Climate in Southeast Alaska in relation to tree growth. 11pp.

4. Alaska Forest Research Center.
1956. Alaska forest research -- problems and present status (Annual Report for 1955). 42pp.

5. James, G. A.
1956. The physical effect of logging on salmon streams of Southeast Alaska. 49pp.

6. Kimmey, James W.
1956. Cull factors for Sitka spruce, western hemlock, and western redcedar in Southeast Alaska. 31pp.

7. Gregory, R. A.
1956. The effect of clearcutting and soil disturbance on temperatures near the soil surface in Southeast Alaska. 22pp.

8. McGregor, R. C.
1958. Small mammal studies on a Southeast Alaska cutover area. 9pp.

9. Alaska Forest Research Center.
1958. Alaska Forest Research -- Biennial report for 1956-1957. 39pp.

10. Lutz, H. J. and A. P. Caporaso.
1958. Indicators of forest land classes in air-photo interpertation of the Alaska Interior. 31pp.

11. Andersen, Harold E.
1959. Silvical characteristics of Alaska-cedar (Chamaecyparis nootkatensis). 10pp.

12. James, George A. and Robert A. Gregory.
1959. Natural stocking of a mile-square clear cutting in Southeast Alaska. 9pp.

13. Alaska Forest Research Center.
1960. Biennial Report -- 1958-1959. 30pp.

Miscellaneous Publications

No.

1. Lutz, H. J.
1960. History of the early occurrence of moose on the Kenai Peninsula and in other sections of Alaska. 25pp.

Technical Notes

No.

1. Taylor, R. F.
1949. First records of growth for Southeast Alaska's young stands. 2pp.

2. Godman, R. M.
1949. What kind of trees make the best growth in Southeast Alaska. 1pp.

3. Taylor, R. F.
1949. First results of thinning in Alaska. 1p.

4. Zach, L. W.
1950. Effect of rainfall on stream flow in Southeast Alaska. 3pp.

5. Lutz. H. J.
1950. Forest fires in Alaska damage more than timber. 1p.

6. Taylor, R. F.
1950. Cubic form class volume tables for Southeast Alaska. 10pp.

7. Godman, R. M.
1951. Thinning second-growth hemlock-spruce for pulpwood. 1p.

8. Zach, L. W.
1951. Past logging affects little of watersheds. Chemical brush control. 2pp.

9. Klein, J. A.
1951. Defect in climax forests of Southeast Alaska. 1p.

10. Zach, L. W.
1951. Distribution of volume in Southeast Alaska trees. 1p.

11. Godman, R. M.
1951. A site classification and "quick-cruise" volume table for climax stands. 3pp.

12. Zach, L. W.
1951. Measuring log lengths. Random plot cruising. 1p.

13. Klein, J. A.
1951. Girdling and poisoning of live culls. 1p.

14. Taylor, R. F. and J. A. Klein.
1953. Preliminary yield tables for Alaska's Interior forests. 6pp.

15. Taylor, R. F.
1953. Preliminary cubic form class volume tables for white spruce in Alaska. 7pp.

16. Godman, R. M.
1953. Seed dispersal in Southeast Alaska. 2pp.

17. ________ and R. A. Gregory.
1953. Physical soil characteristics related to site quality in climax stands of Southeast Alaska. 1p.

18. Godman, R. M.
1953. Moss retards regeneration in Southeast Alaska. 1p.

19. ________
1953. Seasonal distribution of leader growth. 2pp.

20. ________
1953. Seasonal distribution of radial growth. 2pp.

21. Andersen, H. E.
1953. Girdling and poisoning of live culls. 2pp.

22. ________
1953. Range of western redcedar (*Thuja plicata*) in Alaska. 2pp.

23. Gregory, R. A. and G. A. James
1955. The effect of clearcutting on air and soil temperatures in Southeast Alaska. 2pp.

24. James, G. A.
1955. The relationship between precipitation and stream flow on a typical Southeast Alaska stream. 3pp.

25. Andersen, H. E.
1955. Alder control on cutover areas. 1p.

26. ________
1955. Girard form class comparisons for three major species in Southeast Alaska. 2pp.

27. ________
1955. Extension of board foot form-class volume tables for western redcedar. 2pp.

28. ________
1955. Preliminary western redcedar cubic form class volume tables for Southeast Alaska. 12pp.

29. ________
1956. Cubic foot volume tables for spruce and hemlock pole-timber. 1p.

30. McGregor, R. C.
1956. Fire weather measurements in Southeast Alaska, 1955. 2pp.

31. James, G. A.
1956. The rodent problem on cutover areas in Southeast Alaska. 2pp.

32. Andersen, H. E. and J. E. Weisgerber.
1956. Use of long-log scaling tables in Southeast Alaska. 2pp.

33. Andersen, H. E.
1956. The problem of brush control on cutover areas in Southeast Alaska. 2pp.

34. McCambridge, W. F.
1957. A record of spruce cone insects in Alaska. 2pp.

35. Gregory, R. A.
1957. 1956 cone crop report for Alaska tree species. 2pp.

36. ________
1957. A comparison between leader growth of western conifers in Alaska and Vancouver Island. 2pp.

37. Harris, A. S.
1957. The quick cruise circular slide rule. 3pp.

38. Gregory, R. A.
1957. The accuracy of Southeast Alaska site index estimates associated with variable numbers of height measurements. 2pp.

39. James, G. A.
1957. The effect of logging on discharge, temperature, and sedimentation of a salmon stream. 2pp.

40. Haack, Paul M., Jr.
1958. Inexpensive scanning stereoscope. 1p.

41. Gregory, R. A.
1958. 1957 cone crop report for Alaska tree species. 2pp.

42. Lutz. H. J.
1958. Effect of red squirrels on crown form of black spruce in Alaska. 3pp.

43. James, G. A.
1959. Seed production in a scrub stand. 3pp.

44. Gregory, R. A.
1959. 1958 cone crop report for Alaska tree species. 2pp.

45. ________
1960. Identification of spruce seedlings in Interior Alaska. 6pp.

46. Downing, George L.
1960. Some seasonal growth data for paper birch, white spruce, and aspen near Fairbanks, Alaska--1958. 3pp.

47. Gregory, Robert A.
1960. The development of soil organic layers in relation to time in Southeast Alaska. 3pp.

48. ________
1960. Estimating site index in sapling and pole stands in Southeast Alaska. 3pp.

49. ________
1960. Cubic-foot volume tables for paper birch. 1p + 4 tables.

50. Harris, A. S.
1960. 1959 cone crop for Alaska tree species. 3pp.

Forest Insect Survey Reports

No.
1. Downing, G. L.
1957. The recent history of destructive forest insect activity in Alaska. 4pp.

2. ________
1957. An *Ips interpunctus* infestation in white spruce of northern Interior Alaska. 4pp.

3. ________
1958. Status of a spear-marked black moth infestation in Interior Alaska. 3pp.

4. ________
1959. Biological evaluation of an Alaska spruce beetle infestation in spruce stands on the Kenai Ranger District. 6pp.

5. ________
1959. Biological evaluation of the black-headed budworm and hemlock sawfly in the hemlock-spruce stands of Southeast Alaska--Season of 1959. 3pp.

Articles in Periodicals and Books.

Andersen, Harold E.
1956. Use of twin low-oblique aerial photographs for forest inventories in Southeast Alaska. Photogrammetric Engineering 22(5):930-4.

-----------------------.
1956. Clearcutting as a silvicultural system in converting old forests to new in Southeast Alaska. Soc. Amer. Foresters, Proc., 1955, pp. 59-61.

-----------------------.
1956. The forest survey of Southeast Alaska. *In* Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf., pp. 107-8.

-----------------------.
1957. Clearcutting as a silvicultural system in Southeastern Alaska. *In* Science in Alaska, 1954; Proc. Fifth Alaskan Science Conf., pp. 1-4.

-----------------------and George A. James.
1957. Watershed management and research on salmon streams of Southeast Alaska. Jour. Forestry 55(1):14-17.

Godman, Richard M.
1952. A classification of the climax forests of southeastern Alaska. Jour. Forestry 50(6):435-8.

------------------------and Robert A. Gregory.
1955. Seasonal distribution of radial and leader growth in the Sitka spruce-western hemlock forests of Southeast Alaska. Jour. Forestry 53(11):827-33.

------------------------.
1956. Soil-site relationships in the climax forest of Southeast Alaska. In Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf., pp. 112-4.

Gregory, Robert A.
1957. Some silvicultural characteristics of western redcedar in Southeast Alaska. Ecology 38(4):646-9.

------------------------.
1957. Soil temperature changes associated with clearcutting. In Science in Alaska, 1954; Proc. Fifth Alaskan Science Conf. pp. 7-10.

Hall, John L.
1956. A pre-logging salmon stream study. Abstract In Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf., pp. 105-6.

Helmers, A. E.
1960. Alaska forestry--a research frontier. Jour. Forestry 58(6):465-71.

Kimmey, James W.
1956. Survey in Alaska for forest-tree diseases including cull in Sitka spruce and western hemlock. In Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf., pp. 110-2.

Lutz, Harold J.
1951. Damage to trees by black bears in Alaska. Jour. Forestry 49(7):522-3.

------------------------.
1951. The concentration of certain chemical elements in the soils of Alaskan archaeological sites. Amer. Jour. Science 249:925-8.

------------------------.
1952. Occurrence of clefts in the wood of living white spruce in Alaska. Jour. Forestry 50(2):99-102.

------------------------.
1954. Effects of fire on soils in northern forests. In Science in Alaska, 1952; Proc. Third Alaskan Science Conf., pp. 54-5.

------------------------.
1956. Damage to paper birch by red squirrels in Alaska. Jour. Forestry 54(1):31-3.

------------------------.
1956. Forest succession following fires in the Alaska Interior. Soc. Amer. Foresters, Proc. 1955, pp. 57-8.

------------------------.
1958. Observations on "diamond willow", with particular reference to its occurrence in Alaska. Amer. Midland Nat. 60(1):176-85.

McCambridge, W. F.
1956. Effects of black-headed budworm feeding on second-growth western hemlock and Sitka spruce. Soc. Amer. Foresters, Proc. 1955, pp. 171-2.

------------------------.
1956. The black-headed budworm outbreak in Southeast Alaska. In Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf., pp. 109-10.

Taylor, Raymond F.
1951. Alaska Forest research problems and program. Abstract pp. 41-42. In Proc. of the Alaskan Science Conference of the Nat. Acad. of Science, Nat. Res. Council., 1950. Bul. of the Nat. Research Council, No. 122.

------------------------.
1952. Alaska Forest research problem and program, pp. 11-19. In Science in Alaska, Selected papers of the Alaskan Science Conference of the the Nat. Acad. of Science, Nat. Res. Council, 1950, Henry B. Collin, Ed. Artic Inst. of N. Amer., Spec. Publ. No. 1.

------------------------.
(?). Forest research possibilities in Alaska's Interior. In Science in Alaska, 1951; Proc. Second Alaskan Science Conf., pp. 61-5.

------------------------.
1956. The role of forest research in developing an Alaskan resource. In Science in Alaska, 1953; Proc. Fourth Alaskan Science Conf. pp. 97-105.

------------------------.
1956. Alaska. (Chapter 6, pp. 115-25) In A world geography of forest resources, Amer. Geographical Soc. Special Publ. No. 33, 736 pp. New York, Ronald Press Co.

------------------------and R. M. Godman
1950. Increment and mortality in Southeast Alaska's second-growth stands. Jour. Forestry 48(8):329-31.

Zach, Lawrence W.
1950. A northern climax, forest or muskeg? Ecology 31(2):304-6.

-------------------------.
1950. A practical stream gauge recorder house. Jour. Forestry 48(7):491-3.

Miscellaneous and Processed Articles

Andersen, Harold E.
1952. Mapping program in Southeast Alaska and its application to forestry. Paper presented at Third Alaskan Science Conf.; mimeo, 4pp.

-------------------------.
1953. The use of low oblique aerial photographs in timber cruising -- a handbook. 26pp., mimeo.

-------------------------.
1956. Watershed management practice and research on salmon streams of Southeast Alaska. Paper presented to staff meeting, Fish and Wildlife Service, 4pp., mimeo.

Caporaso, A. P.
(?) The forest survey of Southeast Alaska. Alaska Forest Research Center, 7pp., mimeo.

Downing, George L.
1956. Forest insect aerial survey, Public Domain lands, interior of Alaska, August-September 1956. 5pp + map, typewritten.

-------------------------.
1956. Sitka spruce beetle, Southeast Alaska--Appraisal Survey, October 1956. 2pp., typewritten.

-------------------------.
1956. Forest insect conditions in Alaska, 1956. 3pp., mimeo.

-------------------------.
1956. Forest insect aerial survey, southeastern Alaska, July-October 1956. 6pp + map, mimeo.

-------------------------.
1957. Western hemlock damage caused by the black-headed budworm -- appraisal survey. 7pp., mimeo.

(-------------------------).
(1957). Summary of forest insect conditions in Alaska, 1957. 2pp., mimeo.

------------------------.

1957. Forest insect aerial survey, Alaska, July-September, 1957. 5pp., mimeo.

(------------------------).

(1958). Summary of forest insect conditions in Alaska, 1958. 2pp., mimeo.

------------------------.

1958. An outbreak of the spear-marked black moth (*Eulype hastata* (L.)) in Alaska. Paper presented to the Ninth Alaskan Science Conf., 1958; 7pp. typewritten.

(------------------------).

1959. Forest insect conditions in Alaska, 1959. 2pp., mimeo.

Haack, Paul M.

1957. The cumulative 1/5-acre tally sheet for Southeast Alaska cruising. 6pp., mimeo.

McCambridge, W. F.

1953. The black-headed budworm outbreak in Southeast Alaska. Paper presented to the first annual meeting of the Entomological Society of America, 1953; 3pp., typewritten.

------------------------.

1954. Studies of the biology, habits and control of the black-headed budworm in Alaska, season of 1953; 25pp., mimeo.

------------------------.

1954. The black-headed budworm survey on the Tongass National Forest, Alaska, season of 1954, 10pp. + map, mimeo.

------------------------.

1955. A summary statement of forest insect conditions in Alaska, season of 1955. 4pp., + map, mimeo.

------------------------.

1955. The black-headed budworm survey on the Tongass National Forest, Alaska, season of 1955, 8pp. + map, mimeo.

------------------------.

1955. Progress report, studies of the biology and control of the black-headed budworm in Alaska, season of 1954. 13pp., mimeo.

------------------------.

1956. Progress report, studies of the biology and control of the black-headed budworm in Alaska, season of 1955. 11pp., mimeo.

GPO 994725

U.S. DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURAL LIBRARY

UNITED STATES DEPARTMENT OF AGRICULTURE
U.S. DEPARTMENT OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

BOUND BY
HNM